

Dr. Simon A. Carn

Curriculum Vitae

Geological and Mining Engineering and Sciences
Michigan Technological University (MTU)
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Education

St. Catharine's College, University of Cambridge, UK: Ph.D. (1999), Volcanology
Université Blaise Pascal, Clermont-Ferrand, France: D.E.A. (1994), Volcanology and Magmatic Processes
Exeter College, University of Oxford, UK: B.A. Hons (1993), Natural Science - Geology

Employment

Department of Geological and Mining Engineering and Sciences, Michigan Technological University
2008 - Assistant Professor

Joint Center for Earth Systems Technology, University of Maryland Baltimore County
2005 – 2008 Assistant Research Scientist
2001 – 2005 Research Associate

Montserrat Volcano Observatory, Montserrat, West Indies
2000 – 2001 Volcanologist (volcanic gas monitoring specialist)

Honors and Distinctions

William T. Pecora Award (NASA/US DOI) – TOMS Science Team (2006)

NASA Group Achievement Award – Aura Project (2005)

NASA Goddard Space Flight Center Group Achievement Award – Aura Science Team (2005)

Remote Sensing and Photogrammetry Society Len Curtis European Award (2001) – for best scientific paper published in the open remote sensing literature during the year 2000

Professional and Technical Societies

Technical Advisory Committee, UN Project 'Volcano Risk Reduction in Goma, DRC' (2004 – present)

Total Ozone Mapping Spectrometer (TOMS) Science Team (2001 – present)

Ozone Monitoring Instrument (OMI) Science Team (2001 – present)

American Geophysical Union (1994 – present)

International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) (1994 – present)
2008 Secretary, IAVCEI Remote Sensing Commission

Academic Service

Journal reviews: Geophysical Research Letters, J. Geophysical Research, Bulletin of Volcanology, J. Volcanology & Geothermal Research, Atmospheric Chemistry and Physics, J. Applied Meteorology, Geological Society of London Special Publications, AGU Geophysical Monographs, Acta Vulcanologica, J. Photogrammetry and Remote Sensing, Atmospheric Science Letters, International Journal of Remote Sensing, Remote Sensing of Environment, Natural Hazards, Revista Geologica de Chile

Proposal reviews: NASA Solid Earth and Natural Hazards program, National Science Foundation Petrology and Geochemistry program, UK Natural Environment Research Council.

Panel reviews: NASA Earth Surface and Interior program (Geohazards Imaging, 2007), AAAS review of USGS Volcano Hazard Program (2007)

Research Grants

NASA

- 2006 Validation of OMI L2 Sulfur Dioxide Retrievals Over Volcanic and Anthropogenic Sources, NASA Aura Validation NRA, \$550k, 3 yrs (PI)
[Balance of \$163k to be transferred to Michigan Tech in 2009]
- 2005 Near Real-time NASA Volcanic Cloud Data for NOAA, FAA and USGS Decision Support Systems, NASA DECISIONS CAN, \$1,272k, 3 yrs (PI: A. Krueger, UMBC)
- 2004 TOMS Science Team extension, NASA code YS, \$63k, 1 yr (PI: A. Krueger, UMBC)

National Science Foundation

- 2005 Virunga Volcanic SO₂ Emissions Research (VISOR) project, \$300k, 4 yrs (PI)
[Balance of \$124k transferred to Michigan Tech in 2008]
- 2002 Travel grant to attend Chapman Conference on Volcanism and the Earth's Atmosphere, \$600

National Geographic Society Committee for Research and Exploration

- 2004 Virunga Volcanic SO₂ Emissions Research (VISOR) project, \$15k, 1 yr travel grant (PI)

Royal Society

- 2000 Travel grant to attend IAVCEI General Assembly, Bali, Indonesia, \$1k

European Union

- 2005 Network for Observation of Volcanic and Atmospheric Change (NOVAC), EU Sixth Framework Program (PI: B. Galle, Chalmers University, Sweden), 3 yrs (co-I)

Michigan Technological University

- 2008 Century II Campaign Endowed Equipment Fund (C2E2), \$12.5k for equipment (PI)

Teaching and Supervision

- 2009 Fundamentals of Remote Sensing (Spring 2009)
- 2007 Invited guest scientist, International Volcanological Field School, Kamchatka, Russia
- 2006 - Co-advisor of volcanology Ph.D. student at Michigan Technological University, USA
- 2005 – 2006 Co-advisor of volcanology Ph.D. student at Cambridge University, UK
- 2004 – 2006 Co-advisor of volcanology M.S. student at Michigan Technological University, USA
- 2000 Tutor in Volcanology, Dept. of Geography, Cambridge University, UK
- 1999 Lecturer in volcano remote sensing techniques, UNESCO Geological Applications of Remote Sensing program, Philippines Institute of Volcanology and Seismology, Manila, Philippines
- 1994 – 1999 Teaching Assistant, Dept. of Earth Sciences, Cambridge University, UK
- 1994 Tour guide (in French), Volcan de Lemptégy, Clermont-Ferrand, France

Outreach Activities

- 2007 Assisted production of outreach poster ('Sulfur in the Air') for NASA Aura Project
- 2005 Research featured in NOVA popular science TV program on Public Broadcasting Service (PBS) in the USA (<http://www.pbs.org/wgbh/nova/volcanocity/>)
- 2002 – Contributor to NASA's Earth Observatory educational website (<http://earthobservatory.nasa.gov>)
- 2002 – Moderator of Volcanic Clouds email list – a discussion forum for the volcanic cloud remote sensing community
- 2001 – Contributor to the Smithsonian Global Volcanism Program website (<http://www.volcano.si.edu/gvp/index.cfm>)
- 2001 – Developer of OMI/TOMS volcanic emissions website (<http://so2.umbc.edu>)

Publications

Refereed Journals, Monographs and Books

- Bani, P., C. Oppenheimer, V.I. Tsanev, **S.A. Carn**, S.J. Cronin, R. Crimp, J.A. Calkins, D. Charley, and M. Lardy (2009). Surge in sulfur and halogen degassing from Ambrym volcano, Vanuatu, *Bull. Volcanol.* (in press).
- Yang, K., N.A. Krotkov, A.J. Krueger, **S.A. Carn**, P.K. Bhartia, and P.F. Levelt (2009). Improving retrieval of volcanic sulfur dioxide from backscattered UV satellite observations. *Geophys. Res. Lett.*, doi:10.1029/2008GL036036 (in press).
- Carn, S.A.**, A.J. Krueger, N.A. Krotkov, K. Yang, and K. Evans (2009). Tracking volcanic sulfur dioxide clouds for aviation hazard mitigation. *Natural Hazards, Special Issue on Aviation Hazards from Volcanoes*, doi:10.1007/s11069-008-9228-4 (in press).
- Prata, A.J., G.J.S. Bluth, **S.A. Carn**, V.J. Realmuto, and I.M. Watson (2009). Gas Emissions from Volcanoes, in *Satellite Monitoring of Volcanoes: Spaceborne Images of the North Pacific*, eds. K.G. Dean and J. Dehn (in press).
- Clerbaux, C., P.-F. Coheur, L. Clarisse, J. Hadji-Lazaro, D. Hurtmans, S. Turquety, K. Bowman, H. Worden, and **S. A. Carn** (2008). Measurements of SO₂ profiles in volcanic plumes from the NASA Tropospheric Emission Spectrometer (TES). *Geophys. Res. Lett.*, 35, L22807, doi:10.1029/2008GL035566
- Carn, S.A.**, A. J. Prata, and S. Karlsdóttir, Circumpolar transport of a volcanic cloud from Hekla (Iceland). *J. Geophys. Res.*, 113, D14311, doi:10.1029/2008JD009878. [AGU Editor's Highlight]
- Carn, S.A.**, A.J. Krueger, N.A. Krotkov, S. Arellano, and K. Yang (2008). Daily monitoring of Ecuadorian volcanic degassing from space, *J. Volcanol. Geotherm. Res.*, 176(1), 141-150, doi:10.1016/j.jvolgeores.2008.01.029.
- Bluth, G.J.S., and **Carn S.A.** (2008). Exceptional sulphur degassing from Nyamuragira volcano, 1979-2005, *Int. J. Remote Sensing*, 29(22), 6667-6685, doi:10.1080/01431160802168434.
- Krueger, A.J., N.A. Krotkov, and **S.A. Carn** (2008). El Chichon: the genesis of volcanic sulfur dioxide monitoring from space, *J. Volcanol. Geotherm. Res.*, 175, 408-414, doi:10.1016/j.jvolgeores.2008.02.026.
- Krotkov, N.A., B. McClure, R.R. Dickerson, K. Yang, C. Li, **S.A. Carn**, A.J. Krueger, P.K. Bhartia, P.F. Levelt, Z. Li, H. Chen, P. Wang, D. Lu (2008). Validation of SO₂ retrievals from the Ozone Monitoring Instrument (OMI) over NE China. *J. Geophys. Res.*, 113, D16S40, doi:10.1029/2007JD008818.
- Sawyer, G.M., **S.A. Carn**, C. Oppenheimer, V.I. Tsanez, M. Burton (2008). Investigation into magma degassing at Nyiragongo volcano, Democratic Republic of Congo. *Geochem. Geophys. Geosyst.*, 9, Q02017, doi:10.1029/2007GC001829.
- Yang, K., N.A. Krotkov, A.J. Krueger, **S.A. Carn**, P.K. Bhartia, P.F. Levelt (2007). Retrieval of large volcanic SO₂ columns from the Aura Ozone Monitoring Instrument (OMI): comparison and limitations. *J. Geophys. Res.*, 112, D24S43, doi:10.1029/2007JD008825.
- Tedesco, D., O. Vaselli, P. Papale, **S.A. Carn**, M. Voltaggio, G.M. Sawyer, J. Durieux, M. Kasereka, and F. Tassi (2007). The January 2002 volcano-tectonic eruption of Nyiragongo volcano, Democratic Republic of Congo. *J. Geophys. Res.*, 112, B09202, doi:10.1029/2006JB004762.
- Prata, A.J., **S.A. Carn**, A. Stohl, J. Kerkmann (2007). Long range transport and fate of a stratospheric volcanic cloud from Soufriere Hills volcano, Montserrat, *Atmos. Chem. Phys.*, 7, 5093-5103. (<http://www.atmos-chem-phys.net/7/5093/2007/acp-7-5093-2007.html>)
- Carn, S.A.**, N.A. Krotkov, A.J. Krueger, K. Yang, and P.F. Levelt (2007). Peruvian copper smelter emissions measured by the Ozone Monitoring Instrument, *Geophys. Res. Lett.*, 34, L09801, doi:10.1029/2006GL029020.
- Carn, S.A.**, N.A. Krotkov, K. Yang, R.M. Hoff, A.J. Prata, A.J. Krueger, S.C. Loughlin, and P.F. Levelt (2007). Extended observations of volcanic SO₂ and sulfate aerosol in the stratosphere, *Atmos. Chem. Phys. Discuss.*, 7, 2857-2871. (<http://www.copernicus.org/EGU/acp/acpd/7/2857/acpd-7-2857.htm>)
- Tupper, A., I. Itikarai, M. Richards, A.J. Prata, **S.A. Carn**, and D. Rosenfeld (2006). Facing the challenges of the International Airways Volcano Watch: the 2004/05 eruptions of Manam, Papua New Guinea, *Weather and Forecasting*, 22(1), 175-191.
- Krotkov, N.A., **Carn, S.A.**, Krueger, A.J., Bhartia, P.K., Yang, K., (2006). Band Residual Difference algorithm for retrieval of SO₂ from the Aura Ozone Monitoring Instrument (OMI). *IEEE Trans. Geosci. Remote Sensing, AURA Special Issue*, 44(5), 1259-1266, doi:10.1109/TGRS.2005.861932.
- Carn, S.A.**, L.L. Strow, S. de Souza-Machado, Y. Edmonds, S. Hannon (2005). Quantifying tropospheric volcanic emissions with AIRS: the 2002 eruption of Mt. Etna (Italy). *Geophys. Res. Lett.* **32**(2), L02301, doi:10.1029/2004GL021034.

- Wright, R., **Carn, S.A.**, and Flynn, L. (2005). A satellite chronology of the May 2003 eruption of Anatahan volcano. *J. Volcanol. Geotherm. Res.*, 146, 102-116.
- Carn, S.A.**, A.J. Krueger, N. A. Krotkov, M.A. Gray (2004). Fire at Iraqi sulfur plant emits SO₂ clouds detected by Earth Probe TOMS. *Geophys. Res. Lett.*, 31(19), L19105, doi:10.1029/2004GL020719. [AGU highlight, and featured on GRL cover]
- Carn, S.A.** (2004). Eruptive and passive degassing of sulfur dioxide at Nyiragongo volcano (D.R. Congo): the 17 January 2002 eruption and its aftermath. *Acta Vulcanologica*, 14-15, 75-86.
- Rodriguez, L.A., Watson, I.M., Rose, W.I., Branan, Y.K., Bluth, G.J.S., Chigna, G, Matias, O., Escobar, D., **Carn, S.A.**, Fischer, T. (2004). SO₂ emissions to the atmosphere from active volcanoes in Guatemala and El Salvador, 1999-2002, *J. Volcanol. Geotherm. Res.* 138(3-4), 345-364.
- Tupper, A., **Carn, S.A.**, Davey, J., Kamada, Y., Potts, R., Prata, F., and Tokuno, M. (2004). An evaluation of volcanic cloud detection techniques during recent significant eruptions in the western 'Ring of Fire'. *Remote Sens. Environ.* 91, 27-46, doi: 10.1016/j.rse.2004.02.004.
- Carn, S.A.**, Watts, R.B., Thompson, G. and Norton, G.E. (2004). Anatomy of a lava dome collapse: the March 20, 2000 event at Soufrière Hills volcano, Montserrat. *J. Volcanol. Geotherm. Res.* 131(3-4), 241-264.
- Carn, S.A.**, and Bluth, G.J.S. (2003). Prodigious sulfur dioxide emissions from Nyamuragira volcano, D.R. Congo. *Geophys. Res. Lett.* 30(23), 2211, doi:10.1029/2003GL018465.
- Wallace, P., **Carn, S.A.**, Rose, W.I., Gerlach, T.M., Bluth, G.J.S. (2003). Integrating petrologic and remote sensing perspectives on magmatic volatiles and volcanic degassing. *EOS Trans. AGU*, 84(42):441, 446-447.
- Rose, W.I., Gu, Y., Watson, I.M., Yu, T., Bluth, G.J.S., Prata, A.J., Krueger, A.J., Krotkov, N., **Carn, S.**, Fromm, M.D., Hunton, D.E., Viggiano, A.A., Miller, T.M., Ballentin, J.O., Ernst, G.G.J., Reeves, J.M., Wilson, C. and Anderson, B.E. (2003). The February-March 2000 eruption of Hekla, Iceland from a satellite perspective. In: *Volcanism and the Earth's Atmosphere* (eds. A. Robock and C. Oppenheimer), AGU Geophysical Monograph 139, pp. 107-132.
- Carn, S.A.**, Krueger, A.J., Bluth, G.J.S., Schaefer, S.J., Krotkov, N.A., Watson, I.M. and Datta, S. (2003). Volcanic eruption detection by the Total Ozone Mapping Spectrometer (TOMS) instruments: a 22-year record of sulfur dioxide and ash emissions. In: *Volcanic Degassing* (eds. C. Oppenheimer, D.M. Pyle and J. Barclay), Geological Society, London, Special Publications, 213, pp.177-202.
- Matthews, A.J., Barclay, J., **Carn, S.A.**, Thompson, G., Alexander, J., Herd, R.A. and Williams, C. (2002). Rainfall-induced volcanic activity on Montserrat. *Geophys. Res. Lett.* 29(13), doi: 10.1029/2002GL014863.
- Carn, S.A.** and Pyle, D.M. (2001). Petrology and geochemistry of the Lamongan volcanic field, East Java, Indonesia: primitive Sunda arc magmas in an extensional tectonic setting? *J. Petrol.* 42:1643-1683.
- Carn, S.A.** (2001). Landform Monitoring. In: *Encyclopedia of Environmetrics*, John Wiley & Sons Ltd.
- Carn, S.A.** (2000). The Lamongan volcanic field, East Java, Indonesia: physical volcanology, historic activity and hazards. *J. Volcanol. Geotherm. Res.* 95(1-4): 81-108.
- Carn, S.A.** and Oppenheimer, C. (2000). Remote monitoring of Indonesian volcanoes using satellite data from the Internet. *Int. J. Remote Sensing* 21(5): 873-910.
- Carn, S.A.** (1999). Application of synthetic aperture radar (SAR) imagery to volcano mapping in the humid tropics: a case study in East Java, Indonesia. *Bull. Volcanol.* 61: 92-105.
- Sigmarsson, O., **Carn, S.A.** and Carracedo, J.C. (1998). Systematics of U-series nuclides in primitive lavas from the 1730-36 eruption of Lanzarote, Canary Islands, and implications for the role of garnet pyroxenites during oceanic basalt formation. *Earth Planet. Sci. Lett.* 162(1-4): 137-151.

Web-based publications and news items

- NASA EOS Aura mission website (2008) Okmok eruption. <http://aura.gsfc.nasa.gov/science/feature-072308.html>
- National Geographic News (2008) Eruption of Chaitén (Chile). URL <http://news.nationalgeographic.com/news/2008/05/080509-animals-volcano.html>
- NASA Earth Observatory Newsroom (2008) Aerosols from Chaiten Volcano. URL http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=18040
- NASA Earth Observatory Newsroom (2008) Sulfur dioxide and vog from Kilauea. URL http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=18013
- NASA Earth Observatory Newsroom (2008) Sulfur dioxide plume from Kilauea. URL http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17981
- NASA Earth Observatory Newsroom (2008) Sulfur dioxide plume from Llaima volcano. URL http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17887
- NASA Earth Observatory Newsroom (2007) Activity at Manda Hararo. URL

- http://earthobservatory.nasa.gov/NaturalHazards/natural_hazards_v2.php3?img_id=14473
- NASA Earth Observatory Newsroom (2006) Eruption of Mount Nyamulagira (Nyamuragira). URL: http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17483
- NASA Earth Observatory Newsroom (2006) Volcanic activity on Rabaul. URL: http://earthobservatory.nasa.gov/NaturalHazards/natural_hazards_v2.php3?img_id=13922
- NASA Earth Observatory Newsroom (2006) Sulfur dioxide from Soufriere Hills volcano. URL: http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17334
- NASA Earth Observatory Newsroom (2005) Sierra Negra erupts. URL: http://earthobservatory.nasa.gov/NaturalHazards/natural_hazards_v2.php3?img_id=13253
- NASA Earth Observatory Newsroom (2005) Sulfur dioxide leaks from Ambrym volcano. URL: http://earthobservatory.nasa.gov/NaturalHazards/natural_hazards_v2.php3?img_id=12795
- NASA Earth Observatory Newsroom (2005) Sulfur dioxide plume from Manam volcano. URL: http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=16820
- NASA Earth Observatory Newsroom (2005) Eruption of Anatahan. URL: http://earthobservatory.nasa.gov/NaturalHazards/natural_hazards_v2.php3?img_id=12711
- UMBC website (2005) Studying Iraq Fire Pollution. URL: <http://www.umbc.edu/window/carn.html>
- Nature Online (2004) Iraqi fire pollution rivaled volcano. URL: <http://www.nature.com/news/2004/041025/full/041025-5.html>, doi:10.1038/news041025-5
- BBC Online (2004) Iraq sulphur fire breaks records. URL: <http://news.bbc.co.uk/1/hi/sci/tech/3955005.stm>
- NASA Earth Observatory Newsroom (2003) Sulfur dioxide plume lingers over Iraq. URL: http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=15349
- New Scientist (2002) Rainstorms could trigger killer eruptions. URL: <http://www.newscientist.com/news/news.jsp;jsessionid=ECAGKKHHGHDB?id=ns99992755>

Invited talks and seminars

- 2008 Cascades Volcano Observatory, Vancouver, WA, invited seminar, 6 Feb.
- 2007 Cities on Volcanoes 5, Shimabara, Japan, Nov 19-23.
- 2007 Michigan Technological University, Dept. of Geological and Mining Engineering and Sciences, Remote Sensing Institute seminar, 5 Nov.
- 2007 Woods Hole Oceanographic Institution, Dept. of Geology and Geophysics seminar, 26 Oct.
- 2007 International Volcanological Field School, Mutnovsky-Gorely volcanoes, Kamchatka, Russia, Jul 22 – Aug 5 (invited guest lecturer)
- 2007 AGU Joint Assembly, Session V41, Acapulco, Mexico, May 22-25
- 2007 International Conference on Evolution, Transfer and Release of Magmas and Volcanic Gases, Academia Sinica, Taipei, April 22-27 (keynote)
- 2007 4th International Workshop on Volcanic Ash, Rotorua, New Zealand, Mar 22-25
- 2006 AGU Fall Meeting, Session V43, San Francisco, CA, Dec 11-15
- 2006 NASA Graduate Student Summer Program (GSSP) seminar series, invited seminar, 26 July
- 2006 Cities on Volcanoes 4 meeting, Quito, Ecuador
- 2005 Michigan Technological University, Dept. of Geological and Mining Engineering and Sciences, Remote Sensing Institute seminar, 14 Nov
- 2005 Michigan Technological University, Dept. of Geological and Mining Engineering and Sciences, Remote Sensing Institute seminar, 21 Feb.
- 2003 University of Pittsburgh, Dept. Geology and Planetary Sciences Colloquium Series, 7 Nov.
- 2003 8th IAVCEI Field Workshop on Volcanic Gases, Nicaragua/Costa Rica, Mar 26 – Apr 1, Keynote speaker.